

Georgia Department of Transportation

Construction Engineering Inspection Training

Minor Drainage Structures—Group 2



Common Terminology

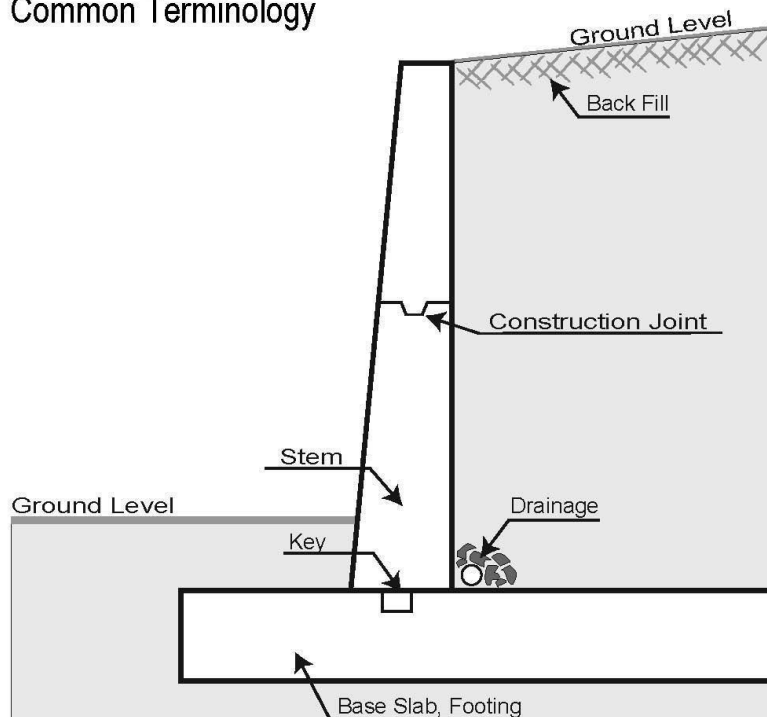


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Section 544: Deck Drain System



General Construction Notes

- Use materials that meet the plan requirements
- Use commercial-grade steel hardware (clips, brackets, bars, etc.) unless otherwise noted on the plans
- Use galvanizing repair compound
- Shop drawings are required for review and approval

Install deck drain systems according to the Plans

Related Specifications

Section	Title
645	Repair of Galvanized Coatings
870	Paint

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Section 547: Pile Encasement



Cleaning

Sandblast piles on existing structures to be encased to remove loose dirt, rust, scale, and other deleterious material from the surface. Rinse thoroughly with clean water. Do not sandblast piles to be used on new construction. Clean new piles with a wire brush to free them of rust or other loose material.

Installation

After cleaning the pile, place steel reinforcement as shown in Figure 1 (page 3). Place spacers, tremie hoses, and fabric jacket or forms according to the Specifications or the manufacturer-recommended methods. Fill the encasement with concrete or mortar.

Limits of Encasement

Ensure that the pile encasement extends from 2 ft (600 mm) below the existing streambed to the top elevation for pile encasement, as shown on the Plans.

Measurement and Payment

Pile Encasement is measured by the linear foot (meter) for each pile size indicated

Pile encasements will be paid for at the Contract Price per linear foot (meter) for the pile size indicated, complete in place as specified. This payment will be full compensation for furnishing all materials, tools, labor, equipment, and other items necessary to complete the Work.

Encasement

To perform encasement, follow the details of Figure 1 and one of the following procedures:

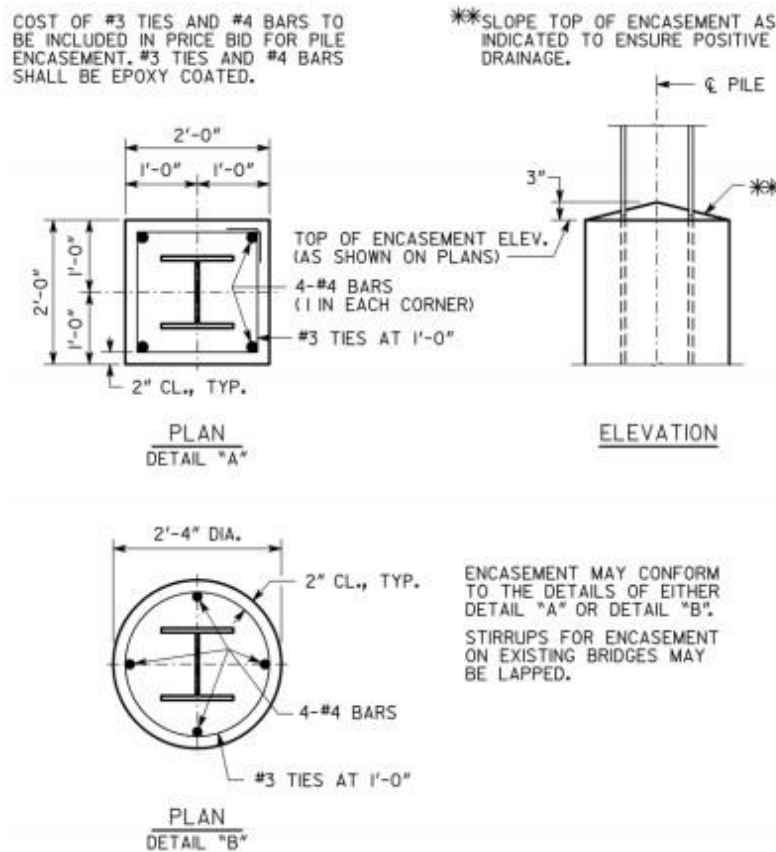


Figure 1

1. Procedure 1
Form the pile encasement with class "A" concrete deposited in water and epoxy-coated steel reinforcement. Place the concrete according to Subsection 500.2.01.E, "Concrete Handling and Placing", where site conditions allow. The Department will not require cofferdams, and concrete may be deposited in water.
2. Procedure 2
Form the pile encasement with a Fabriform Pile Jacket System or an approved equal. Pump mortar into the fabric jacket using two tremie hoses extending to the bottom of the jacket. Withdraw these hoses during pumping so that the lower end remains 1 to 2 ft (300 to 600 mm) under the rising mortar surface.
Pump mortar at a rate to provide a rise of approximately 6 in (150 mm) per minute.

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Section 550: Storm Drain Pipe, Pipe-Arch Culverts, and Side Drain Pipe

Types of Pipe

Use any of the following types of pipe:

- Reinforced concrete
- Nonreinforced concrete
- Corrugated steel or aluminum
- Smooth-lined corrugated high density polyethylene (HDPE)
- Ductile iron
- Polyvinyl chloride (PVC) profile wall drain pipe
- Polyvinyl chloride (PVC) corrugated smooth interior drain pipe
- *Review Qualified Products List (QPL):* See standards 1030, 1401, 9031U, and detail 149.C
- For imperfect trenches see Specifications 207 and 210

Preparation and Backfill

- Shape the foundation material as shown on the plans
- Use graded aggregate material for cross-drain applications
- Use Class II B2 soil or better for longitudinal and side drains



Construction

- Periodically remove any debris or silt constricting the pipe flow to maintain drainage throughout the life of the Contract
- Protect the structure by providing sufficient depth and width of compacted backfill
- Repair damage or displacement from traffic or erosion that occurs after installation and backfilling

Contractor must provide the necessary temporary drainage



Installation

- Check vertical and horizontal alignment of the pipe culvert and drain pipe barrel by sighting along the crown, invert, and sides of the pipe
- Check for sagging, faulting, or invert heaving
- Repair any issues involving incorrect horizontal and/or vertical alignment before backfilling pipe

Pipe Installation

Type	Installation Notes
Concrete	<ul style="list-style-type: none"> • Lay sections in a prepared trench with socket ends pointing upstream • Join sections using either a rubber gasket or preformed flexible sealant
Ductile Iron	<ul style="list-style-type: none"> • Lay pipe sections in a prepared trench, with bells pointing upstream
Corrugated Aluminum or Steel Pipe and Pipe-Arches	<ul style="list-style-type: none"> • Lay sections in a prepared trench with outside laps of circumferential joints pointing upstream and longitudinal joints at the sides
Smooth-Lined Corrugated HDPE Pipe	<ul style="list-style-type: none"> • Use a fitting and coupling that comply with ASTM 2321



Payment

- Pipe installations, complete in place and accepted, are paid at the Contract Price for linear ft (m)

Related Specifications

Section	Title
205	Roadway Excavation
207	Excavation and Backfill for Minor Structures
208	Embankments
645	Repair of Galvanized Coatings
812	Backfill Materials
815	Graded Aggregate
834	Masonry Materials
840	Corrugated Aluminum Alloy Pipe
841	Iron Pipe
843	Concrete Pipe
844	Steel Pipe
845	Smooth Lined Corrugated Polyethylene (PE) Culvert Pipe
846	Polyvinyl Chloride (PVC) Drain Pipe
847	Miscellaneous Pipe

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Section 551: Pile Protection in Earth Walls

Useable Materials

- Cans
- Backfilling Cans
- Corrosion Inhibitor (Grease)
- Polyurethane Foam
- Polypropylene Fluted Sheets
- Duct Tape

Construction

Method A

After driving the end bent piles and before installing the earth reinforcing elements:

1. Place a cylindrical can over each pile to prevent the earth wall backfill material from contacting the pile. Use a can large enough in diameter to give a 1 in (25 mm) minimum clearance from the pile to the inside of the can.
1. Place a spacer between the pile and the can to prevent the can from contacting the pile during wall backfilling. Extend the cans from the bottom of the earth-stabilized backfill to the bottom of the bridge end bent cap.
2. After positioning the cans, seal them at the top while backfilling to keep rubbish or aggregate out of the can. Keep the cans sealed until fill settlement time has expired.
3. When the wall backfill has reached the bottom of the cap and fill settlement time has expired, fill the cans with aggregate.

Method B

Cover the piles with the following amounts of corrosion-inhibiting grease as follows:

- Steel piling ~ 1/16 in (2 mm) minimum
 - Concrete piling ~ 1/4 in (6 mm) minimum
1. Apply grease only after driving the piles. Treat only the pile portion that will be in contact with the wall backfill.
 2. In addition to the grease, install a urethane or polypropylene sleeve to protect the grease coating from the backfill.
 3. Use spray-on or preformed sleeves. Replace portions of the sleeve damaged or removed by construction activities during backfill.

Measurement and Payment

No separate measurement for payment will be made of the materials and labor- required to conform with this Specification

No separate payment will be made for pile protection. Include all costs incurred in complying with this Specification in the price bid for the piling.

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Section 555: Tunnel Liner

Required Equipment

- *Pumping Equipment:* Use a pump with enough horsepower and grouting line pressure to completely fill voids without buckling or shifting liner plates or damaging the roadway
- *Water Control:* Operate well points or other drainage systems in the vicinity of the tunnel construction limits

Tunnel Excavation

Use any of the following procedures to excavate the tunnel:

- Full face
- Heading and bench
- Multiple drift
- Poling plates
- Breast boards
- Shields
- Soil solidification
- A combination of these methods



Liner Plate Installation

- Install self-supporting steel liner plates according to the manufacturer's recommendations
- Seal all segments between the liner plates and the surrounding soil before grouting tunnel liner segments
- Repair damaged spelter coating
- Begin tunnel lining at one end of a pit that has been sheeted and shored as necessary
- Perform the work below the level of the roadbed

Complete tunneling at one location before beginning work at another

- Stop tunnel lining if the Engineer determines it is endangering the overpassing roadway

Payment

- Tunnel lining is paid at the Contract Price bid per linear ft (m) of liner for each diameter and plate thickness

Related Specifications

Section	Title
608	Brick Masonry
615	Jacking or Boring Pipe
645	Repair of Galvanized Coatings
834	Masonry Materials
844	Steel Pile

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Section 560: Structural Plate Pipe, Pipe-Arch, and Arch Culverts



Construction

- Provide necessary temporary drainage
- Immediately remove debris or silt that constricts the flow through a structural plate pipe, pipe-arch, or arch culvert to maintain drainage throughout the Contract life
- Repair and correct damage or displacement from traffic, erosion, or negligence
- Erect structural plate pipe-arches and arches in the sequence recommended by the manufacturer
- Set bolts using drift pins or bars to line up the holes
- Review Standards 1017, 2010, 2011B, and Details 18 and 34



Tighten bolts only after erecting the entire structure

Payment

- Structural Plate Pipe, Pipe-Arch, and Arch Culverts are paid at the Contract Price bid per lump sum

Related Specifications

Section	Title
205	Roadway Excavation
207	Excavation and Backfill for Minor Structures
208	Embankments
645	Repair of Galvanized Coatings
840	Corrugated Aluminum Alloy Pipe
844	Steel Pipe

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Section 561: Renovating Existing Pipe

Required Equipment

- *Batching*: Use weight hoppers and scales for each dry material or calibrated volumetric batch hopper
- *Mixing*: Use a water-tight batch-type mixer capable of blending various materials into a homogeneous mixture
- *Grout*: Use a positive-displacement, piston-type pump-or a screw-type worm pump
- *Pulling*: Provide equipment capable of pulling a newly helically corrugated metal pipe



Construction

- Clean and inspect the existing pipe before pulling or pushing the new pipe through
- Ensure the nose cone has enough strength to withstand the pulling/pushing of the new liner
- Weld or bolt the nose cone to the end of the liner
- Use a nose cone that includes a ring for attaching the pulling cable
- Plug the space between pipes at both ends with concrete or mortar
- Remove the grout pipe caps after the pipe plugs have been placed long enough to develop strength to withstand pressure grouting
- After pumping is complete, replace the grout pipe caps



Use a nose cone on all pipe liners

Payment

- Existing pipe renovation is paid at the Contract Price bid per linear foot (m)

Related Specifications

Section	Title
801	Fine Aggregate
830	Portland Cement
831	Admixtures
844	Steel Pipe
845	Smooth Lined Corrugated Polyethylene (PE) Culvert Pipe
880	Water
882	Lime
883	Mineral Filler

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Section 570: Minor Drainage Structures for Detours

Construction

- Have the Engineer approve the selected construction method
- Use structures that have adequate openings and are suitable for the purpose intended
- Provide for an uninterrupted flow of traffic over the existing highway or the completed detour
- See Specification 149



Payment

- Drainage structures are paid at the Lump Sum price bid for each structure

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Section 573: Underdrains



Construction

- Schedule work so that underdrain installations coincide with operations on the Project
- Excavate according to details and elevations on the plans to intercept water-bearing strata
- Remove unstable material at the bottom of the trench
- Add and compact approved granular material for a stable pipe foundation
- Lay pipe according to plan details with perforations on the pipe's underside
- Lay bell, spigot, and tongue-and-groove pipe with the bell or grooved end upstream and the bells embedded in the foundation material
- Review Standard 9029B

Firmly connect the joints



- Connect the pipe and butt joints securely
- Install the following miscellaneous items as indicated on the plans: pipe screens, caps, plugs, ells, wyes, tees, and markers

Do not disturb pipe alignment during backfilling

- Mark each outlet end of the drainage system according to plan details
- Protect the filter material from contamination by foreign matter

Payment

- Each size of underdrain pipe is paid at the Contract Price per linear ft (m)

Related Specifications

Section	Title
806	Aggregate for Drainage
839	Corrugated Polyethylene Underdrain Pipe
840	Corrugated Aluminum Alloy Pipe
844	Steel Pipe

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Section 574: Edgedrains

Preparation

Pressure grout and cure the pavement slabs in the immediate area

Do not begin work until the Engineer determines pavement slabs are stable



Construction

- Complete any opened trenches (including asphalt cap) each working day
- Install edgedrains with other operations on the Project
- Remove and replace contaminated or damaged materials
- Lay pipe with perforations on the pipe's underside
- Lay bell, spigot, and tongue-and-groove pipe with bell or grooved end upstream and bells embedded in the foundation material
- Connect butt joint pipes securely using the appropriate size and type of band or coupling
- Review Detail D-32



Payment

- Edgedrains are paid at the Contract Price per linear ft (m)

Related Specifications

Section	Title
400	Hot Mix Asphaltic Concrete Construction
800	Coarse Aggregate
839	Corrugated Polyethylene Underdrain Pipe
840	Corrugated Aluminum Alloy Pipe
843	Concrete Pipe
881	Fabrics

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Section 576: Slope Drain Pipe

Construction

- Place the slope drain in an open trench, excavated to the line and grade shown on the plans or as directed
- Lay pipe sections that have circumferential joints with the outside laps of the circumferential joints uphill
- Review Detail D-26



Post-Installation

After installing the pipe:

- Immediately backfill the trench with excavated materials or other approved materials
- Place backfill in 8 in. (200 mm) thick or less
- Compact each layer until firm and stable



Payment

- Slope drain pipe is paid at the Contract Price per linear ft (m) for the size specified

Related Specifications

Section	Title
840	Corrugated Aluminum Alloy Pipe
844	Steel Pipe
845	Smooth Lined Corrugated Polyethylene (PE) Culvert Pipe

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Section 577: Metal Drain Inlets

Locate inlets to avoid future installations such as guardrail posts and lighting standards

Stage Construction

Stage 1

- Install metal drain inlets where shown on the plans or as directed by the Engineer
- Install concrete aprons or rip rap as required by the Engineer
- Crown the roadbed and construct a roll of embankment material at the shoulder line
- Keep gutters, pipes, and inlets open
- Review Detail D-26



Stage 2

- Complete the second-stage operation immediately after paving the shoulders
- Remove each adjacent inlet from its position placed under Stage 1
- Field cut a section of slope drain pipe to the required length to connect existing slope drain pipe to the metal inlet in its new position
- Compact embankment material around the inlet including the subgrade under the asphaltic concrete spillway
- Finish to a smooth, firm surface
- Place asphaltic concrete mixture for a spillway on the prepared subgrade



Payment

- Metal drain inlets are paid at the Contract Price per each

Related Specifications

Section	Title
400	Hot Mix Asphalt Concrete Construction
436	Asphaltic Concrete Curb
441	Miscellaneous Concrete
603	Rip Rap
645	Repair of Galvanized Coatings
844	Steel Pipe